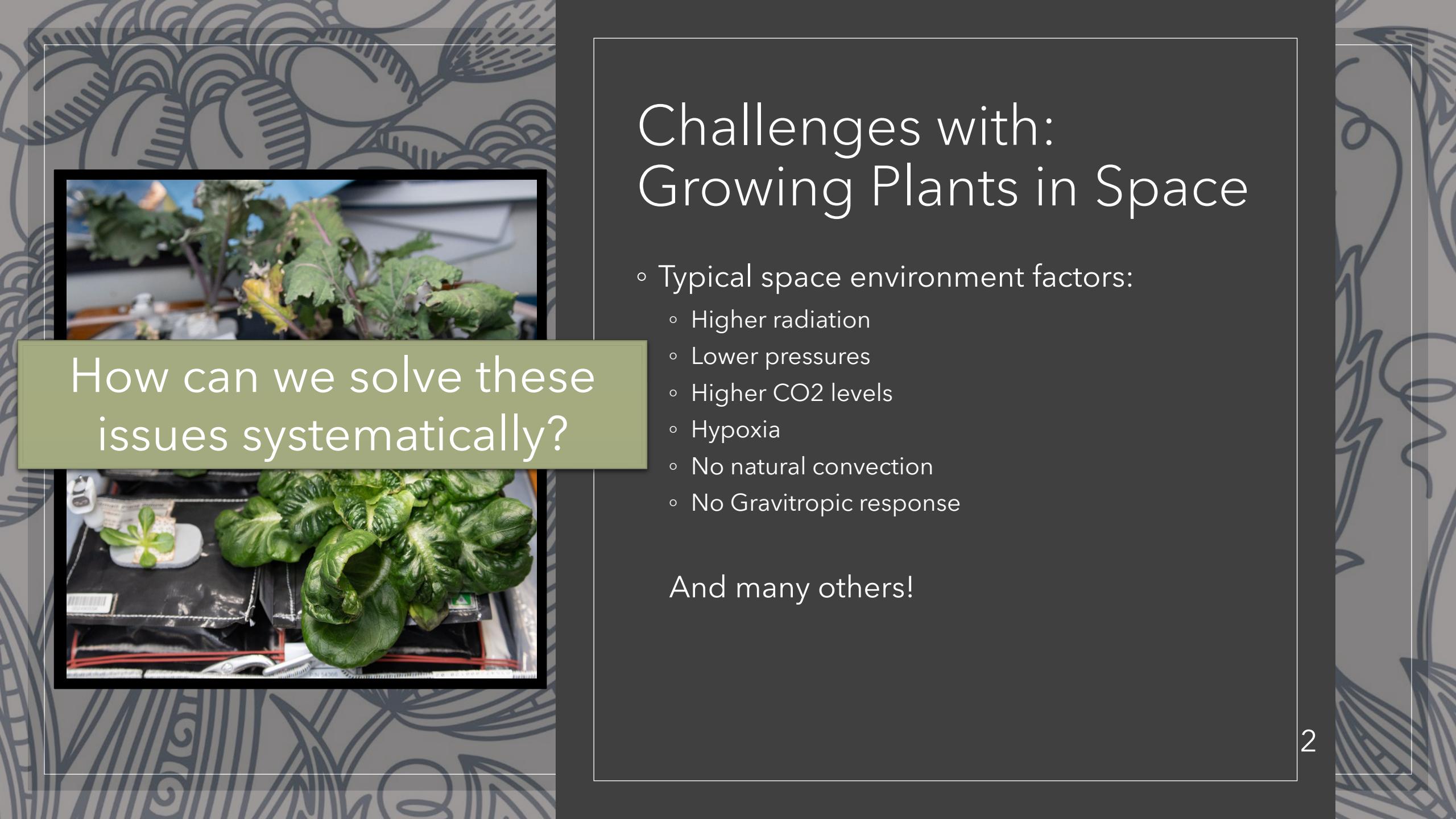


GAPS LIST SPACE CROP PRODUCTION INTERVIEW EVALUATION

Chloe Alexander,
North Carolina State University



Challenges with: Growing Plants in Space

- Typical space environment factors:
 - Higher radiation
 - Lower pressures
 - Higher CO₂ levels
 - Hypoxia
 - No natural convection
 - No Gravitropic response

And many others!



How can we solve these issues systematically?



The Gaps List

Gap ID	Section	Category	Sub-gap	Keyword	Description
1.B.1.0.1	Hardware	Environmental Control	µg Water/Nutrient Delivery	Water Delivery	Lack ability to effectively provide adequate and uniform delivery of water and nutrients to root zones in relevant space environments

- A list of hierarchically arranged issues
 - Attainable
 - Lacking technology or knowledge

Gap Section:

- 1) Hardware
- 2) Crops
- 3) Ecosystem

Gap Category:

- Food Safety
- Sustainability
- Systems Architecture
- Environmental Control
- Environmental monitoring

- Horticultural Practices
- Crop Performance
- Plant Environmental Response

- Food Safety
- Food Security
- Stability
- Plant-Human Interaction
- Multi-crop Interaction

2- Step Interview Process

Interview 1

- Introduction to all current projects



Interview 2

- Assigned each project to the appropriate gaps



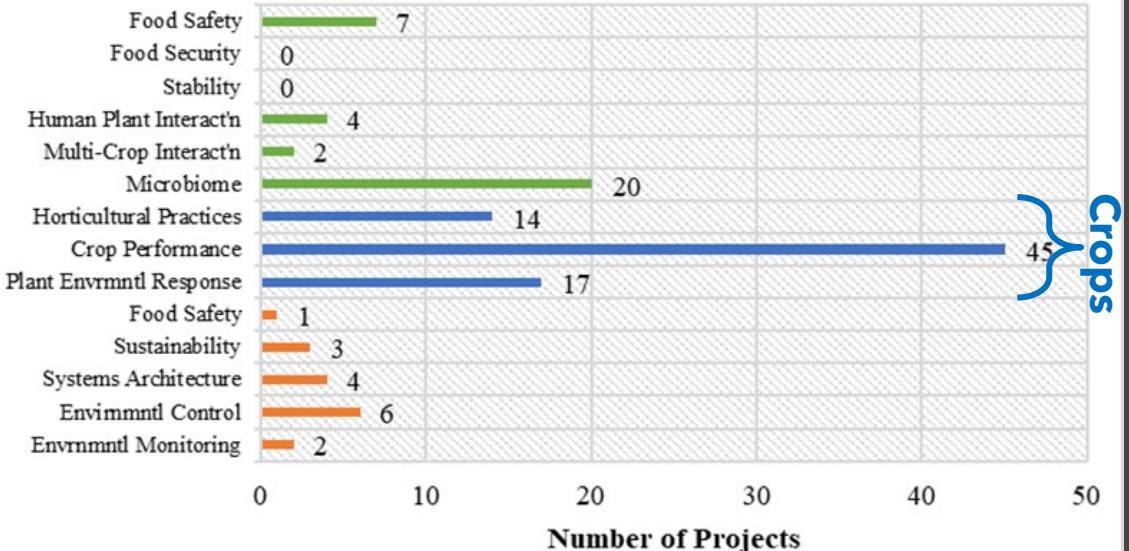
Subject group:

KSC SCP Project Scientists and Post-Doctoral Researchers and their current research

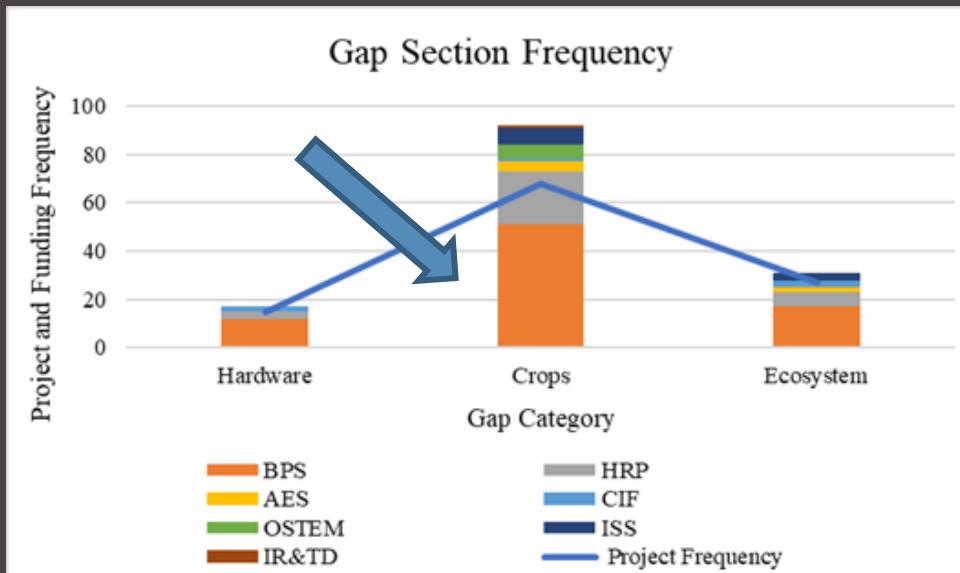
Crops

- (1) several plant growth factors for all candidate crops
- (2) BPS is the main benefactor and is interested in crop growth responses that inform fundamental biological knowledge
- A measure of Scope within the gaps list ensure understanding of the amount of time and support necessary to close the gap

Gap Category Project Frequency



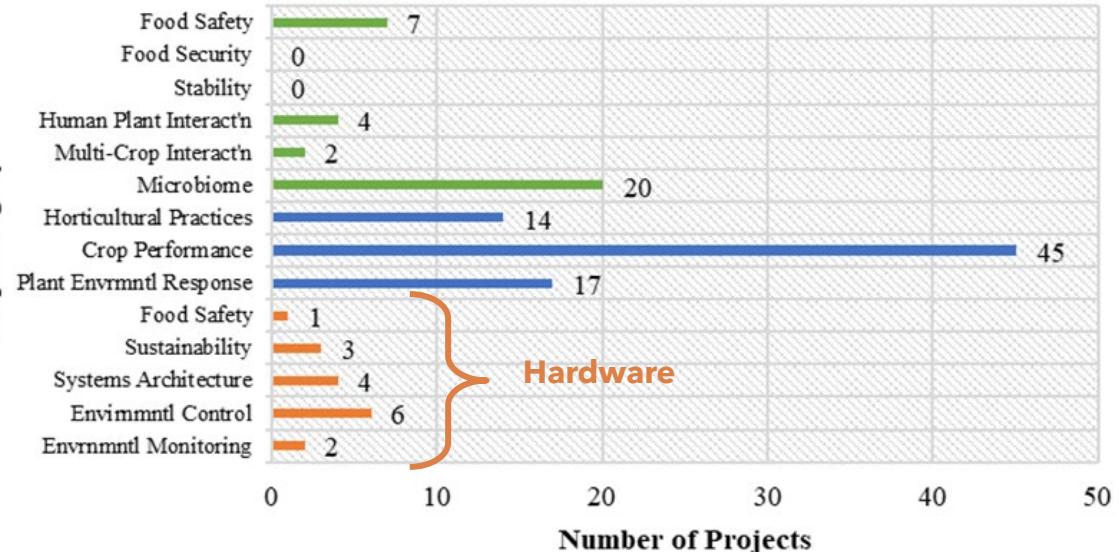
Gap Section Frequency



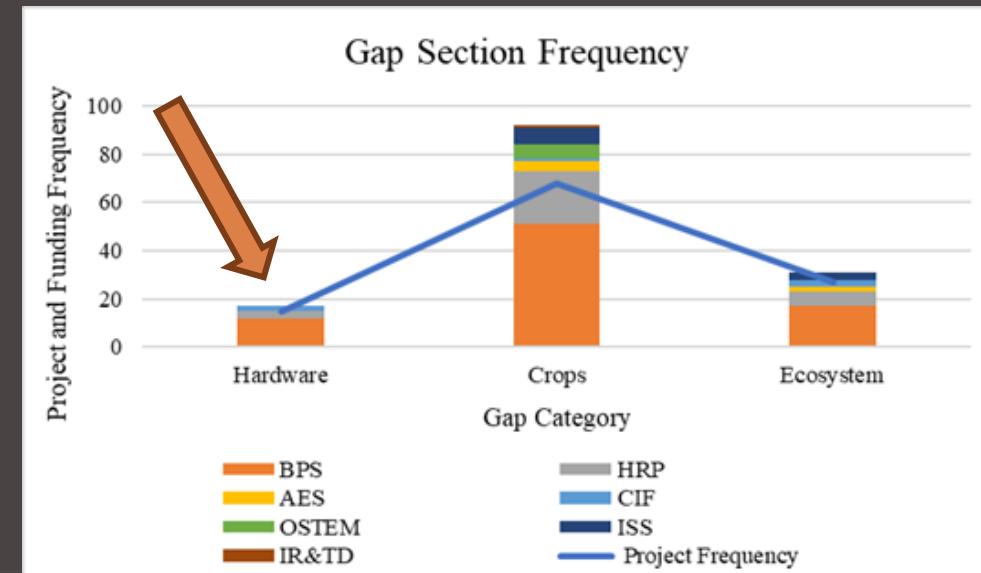
Hardware

- Hardware was the least frequent gap section
- SCP is shifting toward large scale production
- A measure of Priority within the gaps list will draw attention to pertinent gaps

Gap Category Project Frequency



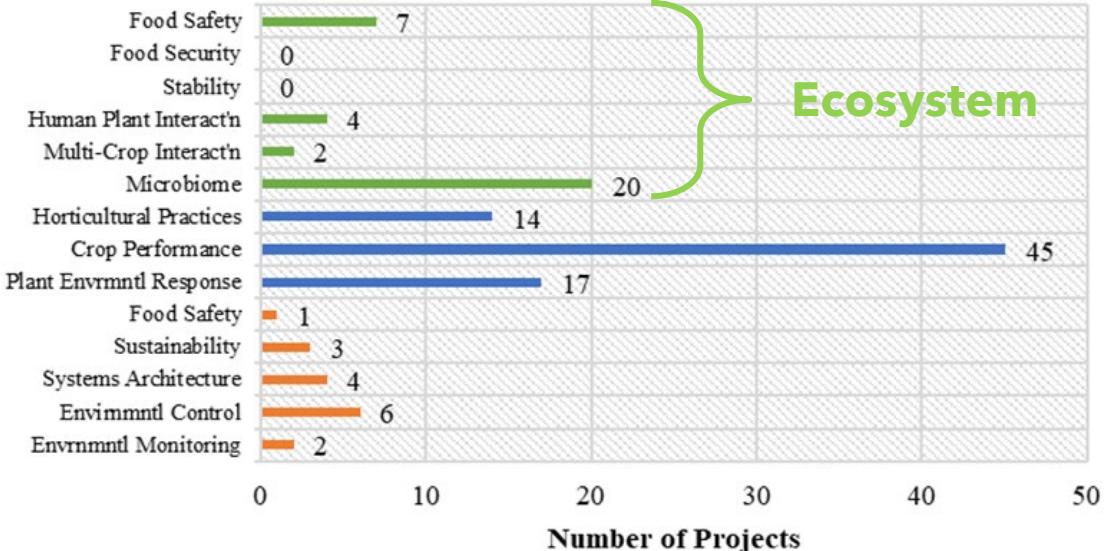
Gap Section Frequency



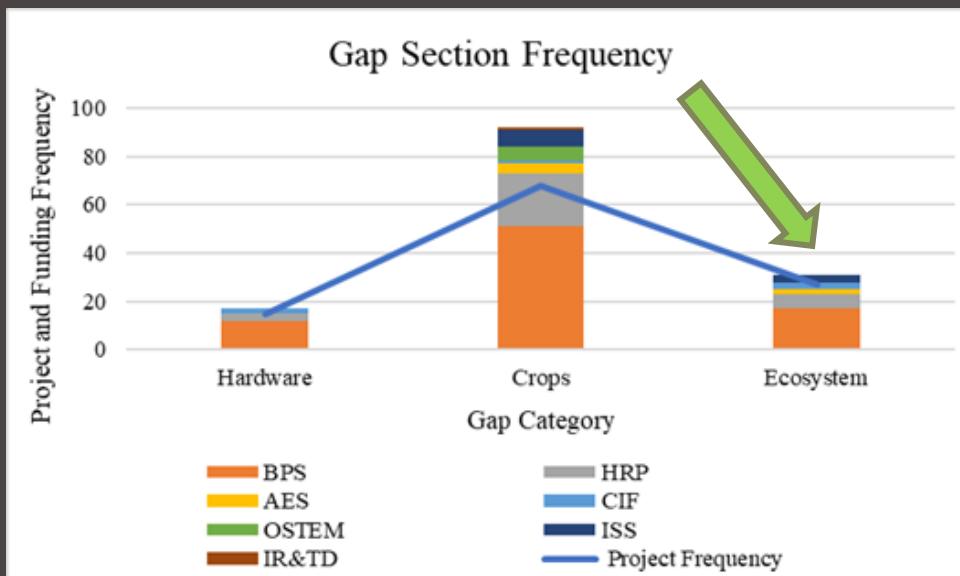
Ecosystem

- Highest number of gaps with 0 representation
- Many Gaps in this section are very complicated/ depend on multiple factors
- A measure of Dependency within the gaps list will draw attention to gaps that must be completed before others

Gap Category Project Frequency



Gap Section Frequency



Overall, we found...

- The Gaps List method is effective.
- The Gaps List was out of date.
- An efficient rate of progress will likely be achieved if adequate support is given to all sections of the Gaps List and the following recommendations are implemented.

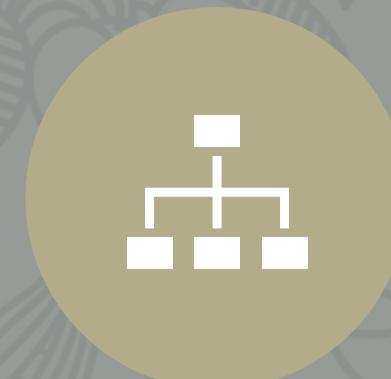
Recommendations

To have these 3 aspects included within or along side the Gaps List:



PRIORITY

Create a new list
that measures
priority



DEPENDENCY

Create a roadmap of gaps
to be completed in
succession



SCOPE

Include words that
define scope within
Gap descriptions

Recommendations

Reevaluate the Gaps List at Regular intervals to assure congruency with the current research questions



REEVALUATE

THANK YOU

Mentors and Co-Authors:

- Gioia Massa and Ralph Fritsche

Interviewees:

- Gioia Massa
- Christina Johnson
- Lucie Poulet
- Raymond Wheeler
- Matt Romeyn
- Aubrie O'Rourke
- Ye Zhang

